

Serial No. 10/017,077
Group Art Unit 1724

IN THE SPECIFICATION

Please amend the specification as follows.

On page 1, on the first line after the title, insert

Δ1 --This patent application is a Division of prior, co-pending
U.S. Patent Application Serial No.: 09/113,982, filed July 10,
1998, now U.S. Patent No. 6,346,195.--.

IN THE CLAIMS:

Please amend the Claims as follows.

Please amend Claim 12 as follows.

12. (Twice Amended) Apparatus for removing metal ions from
wastewater, comprising:

Δ2 (a) a chemical mechanical polishing unit for chemical
mechanical polishing integrated circuits, said chemical mechani-
cal polishing unit having a chemical mechanical polishing efflu-
ent discharge for discharging a wastewater stream containing
byproduct polishing slurry containing copper ions at a level in
the range of about 1-100 mg/l;

(b) a carbon bed connected directly to said chemical
mechanical polishing effluent discharge, said carbon bed provid-
ing means for receiving said wastewater feed containing metal
ions in solution, wherein said wastewater feed contains solids

Serial No. 10/017,077
Group Art Unit 1724

sized in the range of about 0.01-1.0 μm in an amount higher than about 50 mg/l; and

D₂
cont. (c) an ion exchange unit connected directly to said carbon bed, for receiving a carbon bed product stream from said carbon bed and for removing said metal ions from solution.

Please add new Claims 21-29.

21. Apparatus for removing metal ions from wastewater, comprising:

D₃ (a) a chemical mechanical polishing unit for chemical mechanical polishing integrated circuits, said chemical mechanical polishing unit having a chemical mechanical polishing effluent discharge valve for discharging a wastewater stream containing byproduct polishing slurry containing copper ions at a level in the range of about 1-100 mg/l;

(b) means for passing a wastewater feed directly from said chemical mechanical polishing unit to a carbon bed, said wastewater feed containing hydrogen peroxide and metal ions in solution through said carbon bed, wherein said wastewater feed contains solids sized in the range of about 0.01-1.0 micron in an amount higher than about 50 mg/l to form a carbon bed product stream; and

Serial No. 10/017,077
Group Art Unit 1724

(c) means for passing said carbon bed product stream from said carbon bed to an ion exchange unit for removing said metal ions from solution.

22. Apparatus for removing metal ions from wastewater as set forth in claim 21, wherein said wastewater feed contains solids in an amount higher than about 100 mg/l.

D3
cont.
23. Apparatus for removing metal ions from wastewater as set forth in claim 21, wherein said wastewater feed contains solids in an amount in the range of about 500-2000 mg/l.

24. Apparatus for removing metal ions from wastewater as set forth in claim 21, wherein said means for passing said wastewater feed containing hydrogen peroxide and metal ions in solution to said carbon bed reduces the concentration of said hydrogen peroxide and forms a carbon bed effluent having concentration levels of hydrogen peroxide less than about 0.1 mg/l.

Serial No. 10/017,077
Group Art Unit 1724

25. Apparatus for removing metal ions from wastewater as set forth in claim 24, wherein said metal ions comprise copper ions at a level in the range of about 1-100 mg/l.

26. Apparatus for removing metal ions from wastewater as set forth in claim 25, wherein said means for passing said carbon bed product stream from said carbon bed to an ion exchange unit comprises contacting metal ions in said carbon bed product stream with a resin having a macroporous iminodiacetic functional group.

D3
cont.

27. Apparatus for removing metal ions from wastewater as set forth in claim 25, wherein said means for passing said carbon bed product stream from said carbon bed to an ion exchange unit comprises means for contacting said carbon bed product stream metal ions with cross-linked polystyrene resin to attach said copper ions.

28. Apparatus for removing metal ions from wastewater as set forth in claim 27, wherein said means for passing said carbon bed product stream from said carbon bed to an ion exchange unit comprises means for contacting said carbon bed product stream metal ions with cross-linked polystyrene resin screened to

Serial No. 10/017,077
Group Art Unit 1724

provide a bead size in the range of about 0.4 to 1.23 mm with a tight uniformity coefficient of about 1.7 to attach said copper ions.

29. Apparatus for removing copper ions in a byproduct polishing slurry wastewater from the chemical mechanical polishing of integrated circuits, comprising:

Δ3
cont.
(a) a chemical mechanical polishing unit for polishing integrated circuits.

(b) an carbon bed for receiving a byproduct polishing slurry wastewater feed directly from said chemical mechanical polishing of integrated circuits, said byproduct polishing slurry wastewater feed containing copper ions in solution at a level in the range of about 5-25 mg/l and hydrogen peroxide to reduce the concentration of said hydrogen peroxide and form a carbon bed effluent product stream having concentration levels of hydrogen peroxide less than about 0.1 mg/l, wherein said byproduct polishing slurry wastewater feed further contains solids sized in the range of about 0.01-1.0 micron in an amount higher than about 500 mg/l;

(c) means for providing a ion exchange bed of cross-linked polystyrene resin having a bead size in the range of about 0.4 to

Serial No. 10/017,077
Group Art Unit 1724

1.23 mm for receiving a carbon bed product stream from said carbon bed and further having a macroporous iminodiacetic functional group for removing said copper ions from solution;

*D3
cont* (d) means for passing to said carbon bed a byproduct polishing slurry wastewater feed directly from the chemical mechanical polishing of integrated circuits, said wastewater feed containing copper ions in solution at a level in the range of about 5-25 mg/l, hydrogen peroxide, and solids sized in the range of about 0.01-1.0 micron in an amount higher than about 500 mg/l and withdrawing a carbon bed product stream containing copper ions;

(e) means for contacting copper ions in said carbon bed product stream with said cross-linked polystyrene resin in said ion exchange bed to attach said copper ions and form an environmentally clean water discharge product; and

(f) means for regenerating said polystyrene resin with hydrochloric acid.

Please cancel Claim 16.

REMARKS

Claims 12 - 15, 17 - 19, and 21 - 29 are in the case.